

## CHAPTER 5

# NAVY OCCUPATIONAL SAFETY AND HEALTH PROGRAM FUNDAMENTALS

In chapter 1, we gave you background information on the Navy Occupational Safety and Health (NAVOSH) Program. In this chapter, we will discuss the following areas of the NAVOSH Program:

- NAVOSH Program background
- NAVOSH Program elements
- Scope of NAVOSH Program
- Industrial hygiene surveys
- Industrial hygiene terminology
- Heat Stress Control and Prevention Program
- Hearing Conservation Program
- Hazardous Material/Hazardous Waste Program
- Sight Conservation Program
- Asbestos Control Program
- Lead Control Program
- Radiation Protection Program
- Respiratory Protection Program
- Personal Protective Equipment (PPE) and Clothing Program
- Electrical Safety Program
- Tag-Out/Lock-Out Program
- Gas Free Engineering Program
- Medical Surveillance Program
- General safety precautions

The off-duty safety program elements, such as home, traffic, athletic, and recreation safety, are also part of the NAVOSH Program. Chapters 10 and 11 discuss those elements.

### NAVOSH PROGRAM BACKGROUND

Federal law requires the Department of Defense (DOD) and Secretary of the Navy (SECNAV) (as

discussed in chapter 1) to establish occupational safety and health programs. The Chief of Naval Operations (CNO) has established the NAVOSH Program in response to this requirement.

In 1983, the first *NAVOSH Program Manual*, OPNAVINST 5100.23C, was written, defining the Navy's occupational safety and health standards. Since program requirements differed significantly for military equipment, a separate NAVOSH manual was drafted for forces afloat. OPNAVINST 5100.19B, a revision of the *Safety Precautions for Forces Afloat*, was issued in 1989. Numerous changes have been made to these manuals to make them comply with revisions to Occupational Safety and Health Administration (OSHA) standards.

### NAVOSH PROGRAM ELEMENTS

The NAVOSH Program addresses the maintenance of safe and healthful conditions in the workplace or the occupational environment. It applies to all Navy civilian and military personnel and operations, ashore or afloat. The principle elements of the NAVOSH Program, in no particular order of importance, are as follows:

- Training
- Program evaluation
- Safety standards and regulations
- Mishap investigation and reporting
- Hazard control and deficiency abatement
- Inspections, surveys, and medical surveillance

A successful NAVOSH Program is one that reduces work-related injuries and illnesses. That results when every level of the organization emphasizes the program. SECNAV has overall responsibility for the NAVOSH Program. CNO administers the program through the chain of command.

These six program elements are applied through two basic components of the NAVOSH Program: the Occupational Health Program and the Occupational Safety Program.

## OCCUPATIONAL HEALTH PROGRAMS

Occupational health deals with preserving the health of workers on the job. Unlike safety, in which the results of a mishap are quickly clear (such as a fall down a ladder), many occupational illnesses and diseases aren't instantly apparent. They may not show up until years after workers have been exposed to a hazard. Since the effects may be slow to appear, the hazards may not be readily obvious. One good example is hearing loss. Hearing loss normally takes place gradually as a result of years of noise exposure.

The Navy is concerned with occupational health issues as well as safety. They both can affect our sailors' quality of life. They can cause lost work time and cost millions of dollars in worker compensation.

Occupational health programs include the following:

- Heat stress control
- Lead safety
- Sight conservation
- Hearing conservation
- Respiratory protection
- Asbestos control
- Nonionizing radiation and laser safety
- Personal protective equipment (PPE)
- Hazardous material control and management

We will provide in-depth coverage of the preceding programs in this and the following chapters. For additional information, consult the *Navy Occupational Safety and Health (NAVOSH) Program Manual*, OPNAVINST 5100.23C, or the *NAVOSH Program Manual for Forces Afloat*, OPNAVINST 5100.19B.

## OCCUPATIONAL SAFETY PROGRAMS

Occupational safety concerns the prevention of mishaps and injuries that may occur on the job. Most safety mishaps result in immediate injuries and material damage that affect mission readiness. Anytime a sailor loses a day of work because of a mishap, the command loses a valuable resource and part of the team.

The occupational safety components of the NAVOSH Program include the following:

- Deck safety

- Tag-out
- Electrical safety
- Gas free engineering
- Machinery and workshop safety
- Weapons safety (general safety precautions)
- Diving operations (general safety precautions)
- Shipboard aircraft safety (general safety precautions)
- Hazardous material handling, storage, and disposal
- Marine sanitation devices (MSD) and collection, holding, and transfer (CHT) safety

Often, these occupational safety and occupational health programs overlap. Only by taking **all** NAVOSH Program aspects, including on-duty and off-duty safety, into account can we cover the entire spectrum of today's Navy.

## SCOPE OF THE NAVOSH PROGRAM

The NAVOSH Program applies to both civilian and military workers. OPNAVINST 5100.23C, the *NAVOSH Program Manual*, does not address all safety and health standards for civilian and military workers assigned ashore. In those cases, shore personnel must follow OSHA standards or other applicable criteria. For example, since the *NAVOSH Program Manual* does not contain electrical safety standards, it refers readers to 29 CFR 1910, *General Industry Standards*.

OPNAVINST 5100.19B, *Navy Occupational Safety and Health Program Manual for Forces Afloat*, applies to all DOD civilian and military personnel assigned to or embarked on naval vessels. This publication defines safety standards for ships, submarines, and small craft. Volumes II and III of OPNAVINST 5100.19B provide surface ship and submarine safety standards.

## INDUSTRIAL HYGIENE

The shore and afloat NAVOSH manuals refer personnel to industrial hygiene officers or industrial hygienists for assistance. Industrial hygiene is the science of protecting workers' health through the control of the work environment.

Historically, the health of workers was of little concern before 1900, even though diseases were

attributed to certain occupations since the fourth century B.C. The occupational health effects of mining toxic metals, such as lead and mercury, were studied and well documented in 1473. Then in the early 20th century, the U.S. Public Health Service and U.S. Bureau of Mines conducted the first detailed federal studies on worker health. This concern for worker health and safety progressed slowly until 1970, when Congress passed the Occupational Safety and Health Act (OSHA). Industrial hygiene, as a profession, has been around for several hundred years, but didn't become a specialty within the Navy until the 1940s.

Industrial hygiene is both a science and an art; it concerns the total realm of control of the work environment. This realm of control includes recognition and detailed evaluation of workplace environmental factors that may cause illness, lack of well being, or discomfort among workers. Using this information, the industrial hygienist formulates recommendations to alleviate safety and health problems.

When speaking of the work environment, we include the following factors:

- Lighting
- Ventilation
- Air contaminants
- Facility design
- Physical stressors (heat, humidity, vibration, noise, radiation)
- Safety hazards (flying chips, turning shafts, saw blades)

## INDUSTRIAL HYGIENE SURVEYS

An industrial hygiene survey involves inspecting every workplace at the facility or ship, from the overhead to the deck. Inspectors observe work processes and document all potential hazards. To quantify these hazards, inspectors take readings with meters and other types of equipment. They also collect air samples for laboratory analysis (fig. 5-1). They measure noise with a sound level meter. They use small air pumps to collect dust, vapors, or gases to determine exact exposure levels. These exposure levels help determine the hazard to workers and what controls are required. Controls are then tailored to the facility or workplace to eliminate or lessen the hazard. These controls generally fall into three categories:

- Engineering controls (design) and substitution

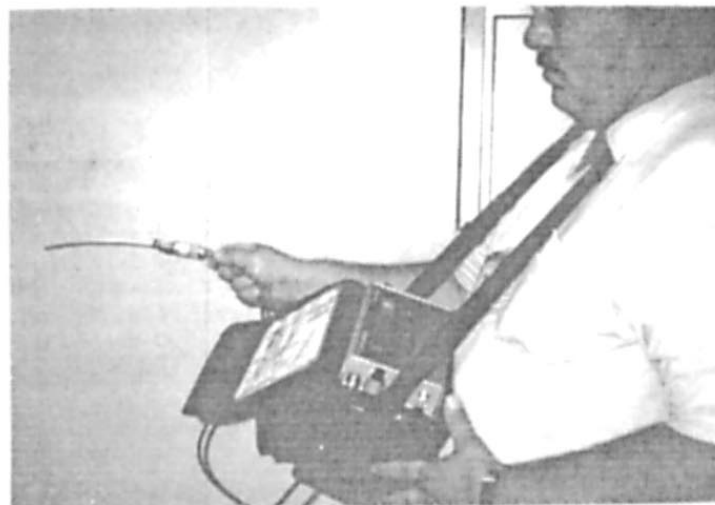
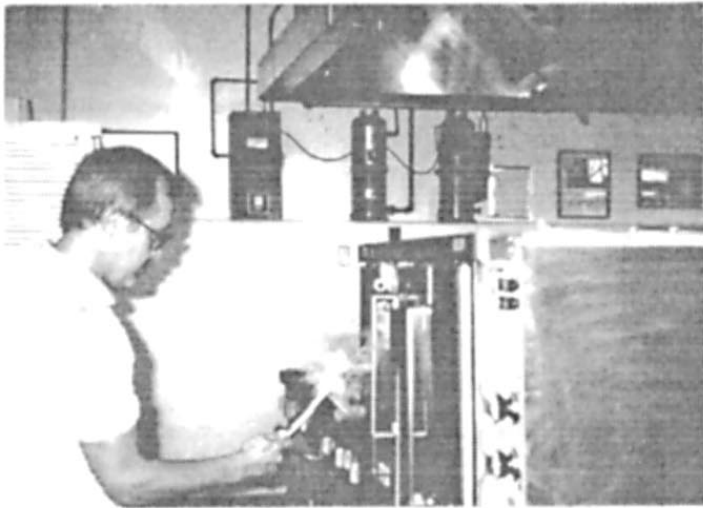
- Administrative controls (e.g., stay times)
- Use of personal protective equipment (PPE)

An industrial hygiene officer, civilian industrial hygienist, or industrial hygiene technician conducts the survey. Medical clinics, environmental and preventive medicine units, destroyer tenders, and submarine tenders provide industrial hygiene support.

## INDUSTRIAL HYGIENE TERMINOLOGY

The following are some of the units and terms you will see on workplace monitoring and industrial hygiene survey reports:

- Action level—Unless otherwise specified in a NAVOSH standard, one-half the relevant permissible exposure level (PEL) or threshold limit value (TLV).
- Ceiling limit (C)—The maximum hazard exposure concentration level, expressed as TLV(C), at which a person may work.
- Concentration—The quantity of a substance per unit volume (in appropriate units). The following are examples of concentration units:
  - mg/m<sup>3</sup>—milligrams per cubic meter for vapors, gases, fumes, or dusts.
  - ppm—parts per million for vapors or gases.
  - fibers/cc—fibers per cubic centimeter for asbestos.
- Decibel (dB)—A unit used to express sound pressure levels; specifically, 20 times the logarithm of the ratio of the measured sound pressure to a reference quantity of 20 micropascals (0.0002 microbars). In hearing testing, the unit used to express hearing threshold levels as referred to audiometric zero.
- Permissible exposure limit (PEL)—The legally established time-weighted average (TWA) concentration or ceiling concentration of a contaminant or the exposure level of a harmful physical agent that must not be exceeded.
- Short-term exposure level (STEL)—The concentration to which workers can be exposed continuously for a short time without suffering from (1) irritation, (2) chronic or irreversible tissue damage, or (3) narcosis.



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**Figure 5-1.—Industrial hygiene officer conducting a survey.**

- Time-weighted average (TWA)—The average concentration of a contaminant in air during a specific period, usually an 8-hour workday or a 40-hour workweek.
- Threshold limit value (TLV)—An atmospheric exposure level under which nearly all workers can work without harmful effects. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH).

## NAVOSH PROGRAMS THAT ADDRESS SPECIFIC HAZARDS

We will now discuss the administration of various NAVOSH programs that address specific hazards. These hazards include hearing conservation, sight conservation, respiratory protection, heat stress, electrical safety (tag-out program), and personal protective equipment. In addition, we will cover hazardous material control and management, asbestos control, gas free engineering, and lead control. OPNAVINST 5100.23C, chapters 7 through 27, and OPNAVINST 5100.19B, volume I, part B, chapters B1 through B12, discuss these subjects in detail. The basic criteria are similar, whether applied ashore or afloat. Refer to the appropriate NAVOSH manual for program details.

## HEAT STRESS CONTROL AND PREVENTION PROGRAM

We define heat stress as any combination of work, air flow, humidity, air temperature, thermal radiation, or internal body condition that strains the body. Heat stress becomes excessive when the strain to regulate its temperature exceeds the body's capability to adjust.

Personnel affected by heat stress can suffer fatigue, nausea, severe headache, and poor physical and mental performance. As body temperature continues to rise (because of prolonged exposure), heat rash and heat injuries (such as heat cramps, heat exhaustion, and heat stroke) occur. Heat stroke severely impairs the body's temperature-regulating ability and can be fatal. Recognizing heat stress symptoms and getting prompt medical attention for affected persons are all-hands responsibilities.

From 1989 to 1992, 68 people received injuries from heat exhaustion or heat stress at shore activities. All of these injuries involved lost time away from work. Thirteen people lost 5 or more workdays. Of the 41 incidents involving military people, 29 (71 percent) people were drilling, playing, or taking part in physical fitness training. The rest were working.

Aboard ship, nearly 50 heat stress reports were filed in 1991, most involving personnel wearing the fire-fighting ensemble (FFE). During Operation Desert Storm, the control of heat stress among engineering plant watch standers was critical. In the hot climate around Saudi Arabia, ships were unable to maintain air conditioning and ice machines that broke down from overuse. Heat stress caused by air and water temperatures above 90°F threatened operational readiness.

## Symptoms of Heat Stress

The following are the symptoms of heat stress and the steps you should take to help the victim:

**Heat Exhaustion:** Victims have pale and clammy skin and experience profuse sweating. Their pulse is fast but weak, and their breathing is fast and shallow. They may experience weakness, nausea, dizziness, and mild cramps. Move victims to a cool location and seek medical attention for them as soon as possible.

**Heat Stroke:** Victims have hot, flushed, dry skin. Their pulse is fast and strong, and their breathing is fast and deep. They may twitch or vomit. Shock will follow. Heat stroke is a life-threatening medical emergency. Call a medical emergency immediately.

## Controlling Heat Stress

You can encounter heat stress aboard U.S. Navy ships in workshops, laundries, sculleries, engineering spaces, food preparation spaces, and steam catapult spaces. Detailed surveys of ship spaces have confirmed that these heat stress conditions often have been so severe that a limit was placed on personnel exposures to avoid serious harm. The primary correctable causes of heat stress in these spaces were as follows:

- Excessive steam and water leaks
- Boiler air casing leaks
- Missing, damaged, improperly installed or deteriorated thermal insulation on steam piping, valves, and machinery
- Ventilation system deficiencies, including design deficiencies, missing or damaged duct work, misdirected terminals, improper or clogged screens, closed or partially closed CIRCLE WILLIAM dampers, dirty ventilation ducting, and inoperative fan motors and controllers

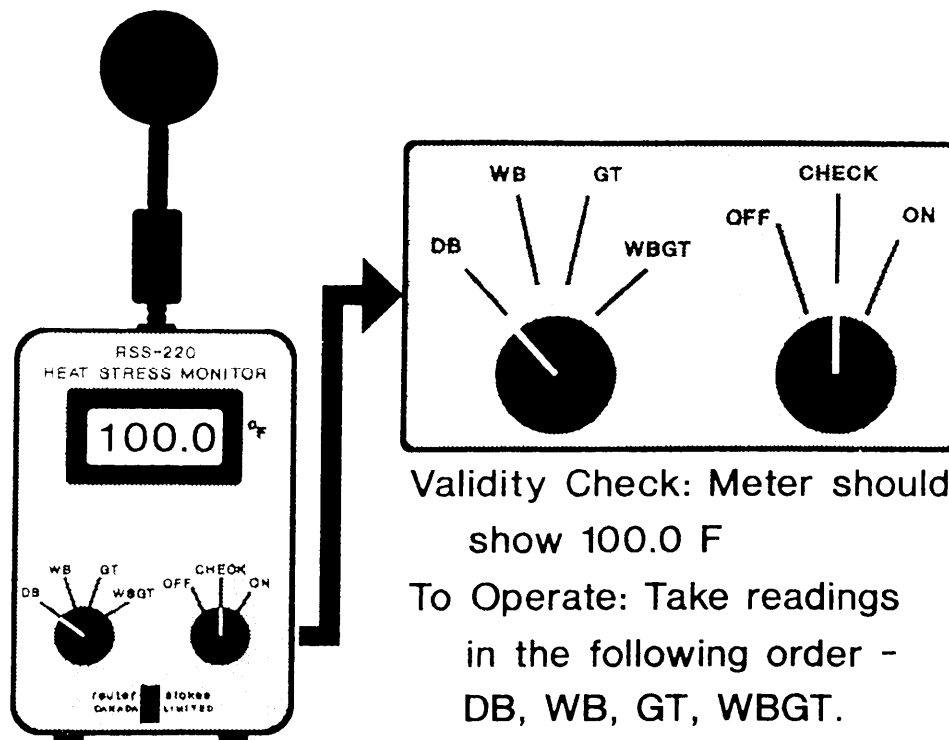


Figure 5-2.—Heat stress monitor.

Heat stress can occur when personnel are wearing layered, impermeable, or impervious clothing such as fire-fighting; chemical, biological, and radiological (CBR); or hazardous material protective clothing. The presence of atmospheric contaminants such as combustion gases or fuel vapors may also contribute to heat stress. Heavy exertion, such as that involved in athletics, in hot, humid weather also leads to heat stress. Other conditions that lead to heat stress include reduced physical stamina because of illness; lack of sleep; or the use of medication, drugs, or alcohol.

Heat stress ashore is of concern when personnel are required to work or drill in hot weather. Many bases raise colored flags to indicate the level of caution required because of the heat.

### Preventing Heat Stress

You can prevent heat stress injury as follows:

1. By detecting, correcting, and controlling the conditions that cause heat stress

2. By using dry bulb thermometers to monitor locations in which heat stress conditions maybe present
3. By restricting personnel exposure to heat stress conditions as the result of heat stress surveys conducted to determine safe stay times
4. By recognizing heat stress symptoms in yourself or in shipmates and acting to prevent or minimize the effects of heat injury

Since dry bulb temperature, humidity, and radiant heat all affect the body and may cause heat stress, you must take all three into account. Conducting a heat stress survey with a wet bulb globe temperature (WBGT) meter (fig. 5-2) provides a calculated WBGT index. You can use this index with a graph of physiological heat exposure limits (PHEL) curves to determine stay times in that environment. Since we cannot reduce the heat, we must reduce the exposure time of the personnel working in that heat. Stay times also take into account the work load of the individual.

You can find further information and guidance on the Navy Heat Stress Control and Prevention Program in OPNAVINST 5100.20C, *Shipboard Heat Stress Control and Personnel Protection*; OPNAVINST

5100.19B, *Navy Occupational Safety and Health Program Manual for Forces Afloat*; and NAVMED P-5010-3, *Manual of Naval Preventive Medicine*, chapter 3, "Ventilation and Thermal Stress Ashore and Afloat."

## HEARING CONSERVATION PROGRAM

The Navy recognizes hearing loss as an occupational hazard related to certain trades. For example, gunfire and rocket fire produce high-intensity impulse or blast noises that can cause hearing loss. Hearing loss can result from the continuous or intermittent noises of aircraft and marine engines, as well as industrial activities. The noise of saws, lathes, grinders, forging hammers, or internal combustion engines also creates a hazard to your hearing.

Hearing loss is a serious concern within the Navy. Action must be taken to reduce hearing loss attributed to occupational exposure. Work-related hearing losses result in costly compensation claims. Hearing loss may also cause lower productivity and efficiency and may contribute to mishaps. To prevent occupational, noise-related hearing loss, the Navy has developed the Hearing Conservation Program.

### Goals of the Hearing Conservation Program

One goal of the Hearing Conservation Program is to prevent occupational hearing loss among military and civilian workers. Another is to ensure personnel can hear well enough to perform their duties. The program elements used to achieve these goals are as follows:

- Surveying all work environments to identify potentially hazardous noise levels and personnel at risk
- Using engineering controls (design methods) to limit noise exposure
- Requiring periodic hearing tests
- Training personnel to protect their hearing when working in hazardous noise environments
- Ensuring personnel use personal protective equipment

Education is vital to the overall success of a hearing conservation program. Make sure your personnel receive instruction in and understand the rationale for the following elements of the Hearing Conservation Program:

- Proper wearing and maintenance of hearing-protective devices and conditions requiring their use
- Command program and personnel responsibilities for off-duty practices to help protect hearing

Encourage your personnel to use hearing-protective devices during off-duty activities that expose them to hazardous noise sources, such as lawn mowers, chain saws, and firearms. All personnel exposed to gunfire during training or to artillery or missile firing under any circumstances must wear hearing-protective devices.

### Noise Measurements

To control hazardous noise exposure, we must accurately determine the actual noise level using standard procedures and compare these levels with accepted criteria. Noise measurements are taken as part of the industrial hygiene survey or the workplace monitoring program for the commands with periodic sampling requirements.

How do you know if you need hearing protection? Use the base-line thumb rule. Hearing protection is required when you must raise your voice to talk to a person who is one arm length away.

Taking noise measurements is part of the base-line or 18-month Industrial Hygiene Survey aboard ship. You need not take actual measurements during the follow-up survey unless you suspect changes in noise levels in the work environment. Keep records of noise measurements until superseded by a later survey. Larger afloat commands may establish a workplace monitoring plan to conduct periodic sampling throughout the 18-month cycle.

Ashore, noise measurements are taken according to the workplace monitoring plan, and records are maintained for 40 years. Resurveys are conducted within 30 days of any significant modifications or changes in work routine.

### Analyzing Noise Measurements

Analyzing noise measurements to assess the hazard potential is a complex task. An industrial hygienist or some other qualified person under the industrial hygienist's direction performs the analysis. The analysis determines hazardous noise areas, equipment, and processes.

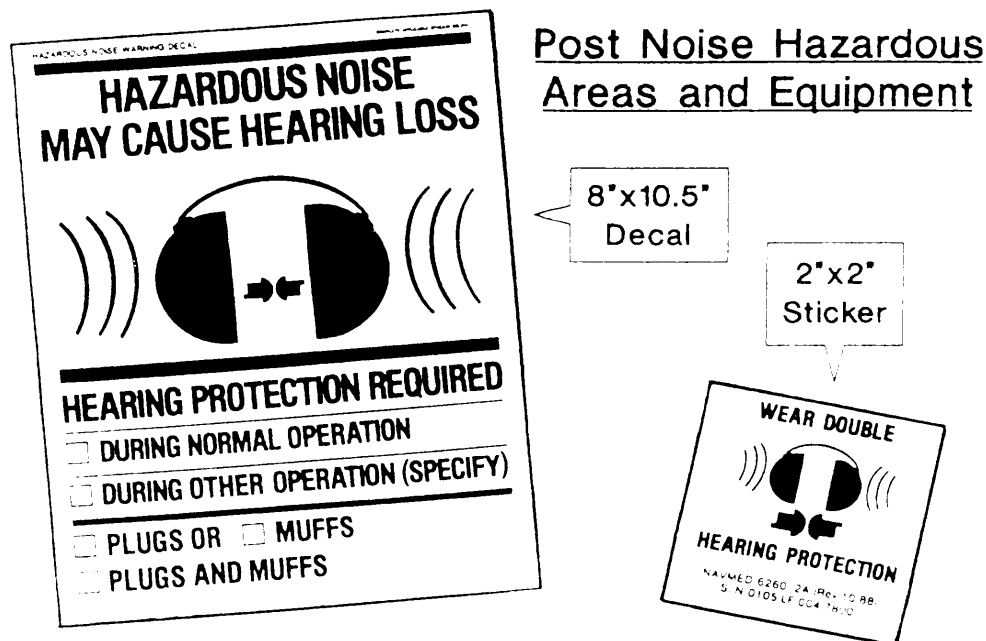


Figure 5-3.—Hazardous noise labels.

The person qualified to take the noise measurements uses a sound level meter to identify all potentially hazardous noise areas. The work areas where the sound level, continuous or intermittent, is routinely greater than 84 dB(A) or where the peak sound pressure level, caused by impulse or impact noise, routinely exceeds 140 dB are considered hazardous noise areas. These areas and equipment are then labeled to warn of the noise hazard.

### Hearing Tests/Audiograms

Hearing tests, or audiograms, are required to monitor the hearing of workers routinely exposed to hazardous noise. Periodic monitoring will allow us to catch a hearing loss before it becomes severe or to correct potential problems with hearing-protective devices. Audiograms test a person's hearing at a variety of frequencies in the human speech range. Audiograms can be conducted at most Navy clinics, aboard tenders, and aboard air capable surface ships.

Personnel working in hazardous noise areas must be entered in the Hearing Conservation Program. Military personnel should have received a reference hearing test upon entry into naval service. Civilian personnel being considered for employment in an occupational specialty or area that involves routine exposure to hazardous noise should receive a reference audiogram. Navy employees presently in service who do not have a reference

audiogram filed in their health record will not be assigned to duty in designated hazardous noise areas until they receive a reference hearing test. All personnel should receive a hearing test periodically and before ending their naval service or civilian service.

### Labelling of Hazardous Noise Areas and Equipment

Make sure you label designated noise-hazardous areas with the approved 8-inch by 10.5-inch decal (fig. 5-3). Normally, you should apply the proper decals to the outside of all doors or hatches leading into the noise-hazardous area. That ensures personnel know what protection they must wear in that area. Label equipment, such as hand tools, with the approved 2- by 2-inch hazardous noise sticker, NAVMED 6260/2A (fig. 5-3). This sticker ensures personnel know whether to wear single or double protection when using that equipment.

### Personal Hearing-Protective Devices

When a hazardous noise area or operation is identified, we try to control or eliminate that noise hazard using engineering controls. These controls include the use of acoustic material, the isolation of noisy equipment, or the substitution of a less noisy process. If we cannot reduce the noise to a safe level, then our only choice is the use of personal protective



equipment, such as earplugs or earmuffs. The equipment is also used as an interim measure until the noise hazard is under control or eliminated.

Personnel working in designated hazardous noise areas or operating noise-hazardous equipment must wear hearing protection devices. They must wear single-type hearing-protective devices when noise levels are greater than 84 dB(A). They must wear a combination of both the insert type and circumaural muff type of hearing-protective devices in all areas where noise levels exceed 104 dB(A).

Each hearing-protective device is tested and assigned a noise reduction rating (NRR). This NRR tells how many decibels the earplug or muff will reduce the external noise. For example, suppose the noise hazard area is measured at 90 dB(A). If you wear an earplug with an NRR of 20 dB, you will only be exposed to 70 dB. That is well below the hazard level of greater than 84 dB(A). These NRRs are listed on earplug and earmuff packaging.

Medical personnel dispense all earplugs requiring fitting. The medical representative measures the examinee's ear canals and instructs him or her on the proper type, size, and use of earplugs. In addition, the examinee learns how to clean and maintain the earplugs. Foam earplugs, earcaps, and earmuffs require no fitting; but personnel must be trained to use them properly.

## **HAZARDOUS MATERIAL/HAZARDOUS WASTE PROGRAM**

We use hazardous materials daily, afloat and ashore, in maintenance, repair, and cleaning. We could not maintain our operational effectiveness without using hazardous materials. In using hazardous materials, however, we may also produce hazardous waste.

We can use hazardous materials effectively and safely if we take care in their handling, storage, and disposal. To help ensure that, OSHA passed a regulation called the *Hazard Communication Standard*, 29 CFR 1910.1200. Since DOD and SECNAV have adopted that regulation, all civilian and military employees of the federal government must comply with it.

The hazardous materials you must use to do your job can be hazardous to your health and the environment if handled improperly. Therefore, you have the right to be trained in the use of hazardous materials and to know any information about those materials that could threaten your safety or health.

To protect your rights and to ensure personnel comply with OSHA and Environmental Protection Agency (EPA) regulations, the Navy has developed a hazardous material control and management program. *Hazardous Material Control and Management (HMC&M)*, OPNAVINST 4110.2, provides the details of this program. OPNAVINST 5100.23C, chapter 7, and OPNAVINST 5100.19B, chapter B3, also discuss hazardous material control and management.

The Naval Supply Systems Command manages the overall program for hazardous material control and management for the Navy. The program objectives are as follows:

- Minimize the amount of hazardous materials in use
- Use hazardous materials safely
- Decrease the amount of hazardous waste we produce

## **Definition of Hazardous Material**

What is hazardous material? We define hazardous material as any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a real hazard to human health or the environment. Hazardous materials include the following categories:

- Aerosols
- Compressed gases
- Oxidizing materials
- Toxic or poisonous materials
- Flammable and combustible materials
- Corrosive materials, such as strong acids and alkalies

Separate directives cover some materials considered hazardous. They include mercury; asbestos; propellants; bulk fuels; ammunition; medical waste; and chemical, biological, and radiological materials.

## **Definition of Hazardous Waste**

We define hazardous waste as any discarded material (liquid, solid, or gas) that meets the definition of hazardous material. Only the Environmental Protection Agency or a state authority may designate material as hazardous waste.

## Categories of Used or Excess Hazardous Material

Afloat units turn in used or excess hazardous materials to Public Works Centers or other shore collection sites. The shore site then restores, recycles, or disposes of the used or excess hazardous materials.

## Material Safety Data Sheets

Material Safety Data Sheets (MSDSs) are technical bulletins containing information about hazardous material (figs. 5-4A and 5-4 B). Manufacturers produce MSDSs based on their testing and research of their products. By law, they must provide the data to hazardous materials users. They tell users how to use, store, and dispose of hazardous material. OPNAVINST 5100.19B requires all hands to follow these guidelines. MSDSs must be in English and contain at least the following information about the material:

- Identity
- Hazardous ingredients
- Physical and chemical characteristics
- Physical hazards
- Reactivity
- Health hazards
- Precautions for safe handling and use
- Control measures
- Routes of entry into the body
- Emergency and first-aid procedures for exposure
- Date of preparation of the MSDS or last change
- Name, address, and phone number of a responsible party who can provide additional information on the hazardous material and appropriate emergency procedures

Manufacturers may use any format or arrangement of this information, but every MSDS must include all the items. Some MSDSs contain ingredient information that the manufacturer considers proprietary (a trade secret). Proprietary information is provided on the compact disk-read only memory (CD-ROM) labeled “LR” version. The “L” version does not contain proprietary information. Only safety and health professionals should have access to the “LR” version of the CD-ROM.

Every hazardous material user must be trained on the precautions associated with that material. MSDSs must be available upon request to any user. If you have a question, check with your command’s hazardous material/hazardous waste coordinator.

## Hazardous Materials Information System

The Hazardous Materials Information System (HMIS) is a computerized data base of Material Safety Data Sheets (MSDSs). It provides information for people working in hazardous materials management. The system provides basic technical information required at all levels to aid in the proper handling, storage, transportation, and disposal of hazardous materials. In addition, it provides information about safety, health, and environmental functions.

The HMIS data base provides useful information on more than 70,000 hazardous materials used by DOD. The Naval Supply Systems Command distributes the data base quarterly on Compact Disk-Read Only Memory (CD-ROM) as part of the *Hazardous Material Control Management (HMC&M)* CD-ROM, which contains the following materials:

- HMIS data base with MSDSs and labels
- *Hazardous Material Afloat Program (HMAP) Management Guide*
- *Hazardous Material User’s Guide (HMUG)*
- *Ships Hazardous Material List (SHML)*
- *Safety Equipment Shopping Guide*
- Naval Safety Center roster
- Various hazardous material and environmental compliance instructions
- Tutorial for hardware and software

Each ship and most shore stations have been issued computer compact disk (CD) players, which are on distribution for *HMC&M* updates. Navy Environmental and Preventive Medicine Units (NePMUs) also offer a 1-day course that covers the retrieval of data, including the type of data available, from the HMIS system.

## Labeling of Hazardous Materials

Labeling provides the handler, shipper, and user of a hazardous material with critical information. You must ensure every container of hazardous material has

DOD Hazardous Materials Information System  
DOD 6050.5 5-LR  
AS OF MAY 1992  
For U. S. Government Use Only

FSC: 6505  
NIIN: 001538480

Manufacturer's CAGE: 1BF21

Part No. Indicator: A

Part Number/Trade Name: HYDROGEN PEROXIDE SOLUTION 3%

General Information

Item Name: HYDROGEN PEROXIDE TOPICAL SOLUTION, USP

Manufacturer's Name: MALLINCRODT INC

Manufacturer's Street:

Manufacturer's P.O. Box: M

Manufacturer's City: PARIS

Manufacturer's State: KY

Manufacturer's Country: US

Manufacturer's Zip Code: 40361-0315

Manufacturer's Emerg Ph #: 314-982-5000

Manufacturer's Info Ph #: 314-982-5000

Distributor/Vender # 1: RUGER CHEMICAL CO. INC.

Distributor/Vender # 1 Cage: 64220

Distributor/Vender # 2:

Distributor/Vender # 2 Cage:

Distributor/Vender # 3:

Distributor/Vender # 3 Cage:

Distributor/Vender # 4:

Distributor/Vender # 4 Cage:

Safety Data Action Code:

Safety Focal Point: D

Record No. For Safety Entry: 001

Tot Safety Entries This Stk#: 006

Status: SE

Date MSDS Prepared: 21JAN86

Safety Data Review Date: 05DEC90

Supply Item Manager: KX

MSDS Preparer's Name:

Preparer's Company:

Preparer's St Or P.O. Box:

Preparer's City:

Preparer's State:

Preparer's Zip Code:

Other MSDS Number:

MSDS Serial Number: BJFCN

Specification Number:

Spec Type, Grade, Class:

Hazard Characteristic Code: P2

Unit Of Issue: BT

Unit Of Issue Container Qty: 1 PT

Type Of Container: BOTTLE

Net Unit Weight: 1.16 LBS

NRC/State License Number:

Net Explosive Weight:

Net Propellant Weight-Ammo:

Coast Guard Ammunition Code:

Ingredients/Identity Information

Proprietary: NO

Ingredient: HYDROGEN PEROXIDE, SOLUTION 3%

Ingredient Sequence Number: 01

Percent: UNKNOWN

Ingredient Action Code:

Ingredient Focal Point: D

NIOSH (RTECS) Number: 1005359HP

CAS Number: UNKNOWN

OSHA PEL: UNKNOWN

ACGIH TLV: UNKNOWN

Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance and Odor:; CLEAR, COLORLESS SOLUTION, ODORLESS.

Boiling Point: 212F,100C

Melting Point: 32.0F,0.0C

Vapor Pressure (MM Hg/70 F): N/K

Vapor Density (Air=1): N/K

Specific Gravity: N/K

Decomposition Temperature: UNKNOWN

Evaporation Rate and Ref: N/K

Solubility In Water: INFINITELY

Percent Volatiles By Volume: N/R

Viscosity:

pH: N/R

Radioactivity:

Form (Radioactive Matl):

Magnetism (Milligauss):

Corrosion Rate (IPY): UNKNOWN

Autoignition Temperature:

Fire and Explosion Hazard Data

Flash Point: N/K

Flash Point Method: N/K

Lower Explosive Limit: N/K

Upper Explosive Limit: N/K

Extinguishing Media: MAY USE WATER SPRAY TO PUT OUT SURROUNDING FIRE & COOL EXPOSED CONTAINERS. WATER SPRAY WILL REDUCE FUME & IRRITANT GAS.

Special Fire Fighting Proc: USE NIOSH APPROVED SCBA WITH FULL POSITIVE PRESSURE FACE PIECE & CLOTHING. NOT COMBUSTIBLE, BUT LIQUID IS OXIDIZER & MAY IGNITE/W REDUCING AGENTS/COMBUSTIBLES.

Unusual Fire and Expl Hazards: EXTREMELY VIOLENT COMBUSTION IF CONTACT WITH OXIDIZING SUBSTANCES. DRIED CONCENTRATED HYDROGEN PEROXIDE/COMBUST. MATERIAL ON CLOTHES MAY CAUSE FIRE OR EXPLOSION.

Reactivity Data

Stability: NO






Cond To Avoid (Stability): HEAT. SPONTANEOUS COMBUSTION MAY OCCUR ON STANDING IN CONTACT WITH READILY FLAMMABLE MATERIALS.

Materials to Avoid: REDUCING AGENTS, ORGANIC MATERIALS, DIRT, ALKALIES, RUST & MAY METALS.

Figure 5-4A.—Material Safety Data Sheet (front).

<p>Hazardous Decomp Products: DECOMPOSES TO WATER &amp; OXYGEN WITH RAPID HEAT RELEASE. USE VENTED CONTAINERS. SOLUTION CAN DECOMPOSE RAPIDLY UPON HEATING</p> <p>Hazardous Poly Occur: NO</p> <p>Conditions To Avoid (Poly): NOT APPLICABLE</p>	<table border="1"> <tr> <th>Transportation Data</th> </tr> <tr> <td> <p>Transportation Action Code:</p> <p>Transportation Focal Point: D</p> <p>Trans Data Review Date: 90339</p> <p>DOT PSN Code: ZZZ</p> <p>DOT Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION</p> <p>DOT Class: N/R</p> <p>DOT Label: N/R</p> <p>Limited Quantity: NO</p> <p>DOT Mode Indicator:</p> <p>Identification Number: N/R</p> <p>Reportable Qty--Trans File: NO</p> <p>DOT/DoD Exemption Number:</p> <p>IMO PSN Code: ZZZ</p> <p>IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION</p> <p>IMO Regulations Page Number: N/R</p> <p>IMO UN Number: N/R</p> <p>IMO UN Class: N/R</p> <p>IMO Subsidiary Risk Label: N/R</p> <p>IATA PSN Code: ZZZ</p> <p>IATA UN ID Number: N/R</p> <p>IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION</p> <p>IATA UN Class: N/R</p> <p>IATA Subsidiary Risk Class: N/R</p> <p>IATA Label: N/R</p> <p>AFR 71-4 PSN Code: ZZZ</p> <p>AFR 71-4 Prop. Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION</p> <p>AFR 71-4 Class: N/R</p> <p>AFR 71-4 Label: N/R</p> <p>AFR 71-4 ID Number: N/R</p> <p>AF MMAC Code:</p> <p>Tech Entry NOS Shipping Name:</p> <p>Additional Trans Data:</p> </td> </tr> </table>	Transportation Data	<p>Transportation Action Code:</p> <p>Transportation Focal Point: D</p> <p>Trans Data Review Date: 90339</p> <p>DOT PSN Code: ZZZ</p> <p>DOT Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION</p> <p>DOT Class: N/R</p> <p>DOT Label: N/R</p> <p>Limited Quantity: NO</p> <p>DOT Mode Indicator:</p> <p>Identification Number: N/R</p> <p>Reportable Qty--Trans File: NO</p> <p>DOT/DoD Exemption Number:</p> <p>IMO PSN Code: ZZZ</p> <p>IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION</p> <p>IMO Regulations Page Number: N/R</p> <p>IMO UN Number: N/R</p> <p>IMO UN Class: N/R</p> <p>IMO Subsidiary Risk Label: N/R</p> <p>IATA PSN Code: ZZZ</p> <p>IATA UN ID Number: N/R</p> <p>IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION</p> <p>IATA UN Class: N/R</p> <p>IATA Subsidiary Risk Class: N/R</p> <p>IATA Label: N/R</p> <p>AFR 71-4 PSN Code: ZZZ</p> <p>AFR 71-4 Prop. Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION</p> <p>AFR 71-4 Class: N/R</p> <p>AFR 71-4 Label: N/R</p> <p>AFR 71-4 ID Number: N/R</p> <p>AF MMAC Code:</p> <p>Tech Entry NOS Shipping Name:</p> <p>Additional Trans Data:</p>		
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Figure 5-4B.—Material Safety Data Sheet (back).

HAZARDOUS CHEMICAL WARNING LABEL						
1. CHEMICAL / COMMON NAME						
2. HAZARD CODE			3. NSN / LSN			
4. PART NUMBER						
5. ITEM NAME						
6. HAZARDS (x all that apply)		(1) Acute (Immediate)				(2) Chronic (Delayed)
		NONE	SLIGHT	MODERATE	SEVERE	
a. HEALTH						
b. CONTACT						
c. FIRE						
d. REACTIVITY						
7. SPECIFIC HAZARDS AND PRECAUTIONS (Including Target Organ Effects)						
(See MSDS for further information)						
8. PROTECT (x all that apply)			a. EYES		b. SKIN	c. RESPIRATORY
9. CONTACT: a. COMPANY NAME						
b. ADDRESS (Street, P.O. Box, City, State, Zip Code and Country)						
c. EMERGENCY TELEPHONE NUMBER (Include Area Code)						
10. PROCUREMENT YEAR FOR HAZARDOUS CHEMICAL						

DD Form 2522 (1C), DEC 88

S/N 0102-LF-012-1100  
☆ GPO: 1991-507-027

C347.3

Figure 5-5.—Hazardous Chemical Warning Label.

a label. Tank trucks and railroad tank cards must be placarded with Department of Transportation (DOT) symbols.

Although the format of the label may differ from company to company, the OSHA Hazard Communication Standard mandates that certain information appear on the label. That information includes the following:

- Identity of the material or chemical

- Name and address of the manufacturer or responsible party
- The appropriate hazard warning

DOD has a hazardous Chemical Warning Label (fig 5-5). DOD personnel must use this label on DOD manufactured hazardous materials, repackaged containers, tanks of hazardous chemicals, and unlabeled materials already in the DOD system. The labels are

printed directly from the Hazardous Material Information System (HMIS) data base CD-ROM on self-adhesive forms or plain paper.

Several types of multicolored signs, placards, and decals are used to provide visual hazard warnings. They may contain words, shapes, symbols, pictures, or any combination of these. Sometimes they picture the international symbols for gloves, aprons, goggles, and respirators. These international symbols appear as small pictures (called *icons*) on the label showing the required protective equipment.

Manufacturers use various symbols and DOT shipping labels with the required OSHA labeling. Used alone, these DOT symbols or labels **do not** meet the OSHA labeling requirements. Navy personnel should not place any labels on containers that already have proper labels. If you buy or receive a hazardous material with the minimum required labeling, do not add any additional labeling. If you have an unlabeled container **or** one with a damaged label, you can print a label from the HMIS CD-ROM onto plain paper or the DD Form 2522.

## SIGHT CONSERVATION PROGRAM

The Navy must provide eye protection, at government expense, for personnel working in eye-hazardous areas. Workers must wear appropriate eye protection when performing eye-hazardous operations such as pouring or handling molten metals or corrosive liquids and solids. Personnel must also wear eye protection when cutting and welding, drilling, grinding, milling, chipping, sand blasting, or performing other dust- and particle-producing operations. Anyone near such operations, including visitors, also must wear eye-protective equipment. OPNAVINST 5100.23C, chapter 19, and OPNAVINST 5100.19B, chapter B5, provide more information on the Navy's Sight Conservation Program.

### Basic Sight Program Requirements

All Navy activities that perform eye-hazardous operations must have a sight conservation program. The program should include, but is not restricted to, the following:

- Determination and evaluation of eye-hazardous areas, processes, and occupations
- Operation of a vision and medical screening program

- Operation of an effective equipment maintenance program
- Compliance with procedures for the use of temporary eye wear
- Operation of a comprehensive training/education program
- Operation of an effective enforcement program

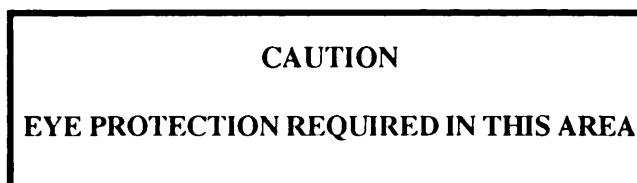
The Navy considers any person found to have vision in one eye of 20/200 or worse to be visually impaired. You cannot assign people who have a visual impairment to duties that present a hazard to their remaining eye. Make certain these personnel always wear protective eye wear, regardless of their occupation or work station.

To setup an effective sight conservation program, activity safety officers must identify eye-hazardous areas and ensure they are posted with warning signs. Commands must equip these areas with emergency eyewash facilities. Safety officers must also identify eye-hazardous occupations and processes that require personal protective equipment and determine the safeguards needed.

Safety officers maintain a listing of areas, processes, and operations that require eye protection. In addition, they keep a listing of areas requiring eyewash or deluge shower facilities. Safety officers maintain eye injury records and ensure the program is evaluated for compliance and effectiveness.

### Labelling of Sight Hazard Areas

A warning sign and 3-inch yellow and black striping or checkerboard markings on the deck identify eye-hazardous areas. The black and yellow striping or checkerboard pattern outlines the eye hazardous area. The sign warning of an eye hazard area is mounted directly on the hazard, part, machinery, boundary bulkhead or door in a conspicuous location. Caution signs should read as follows:



The words should be in black letters on a yellow background. The signs and tape are available in the supply system.

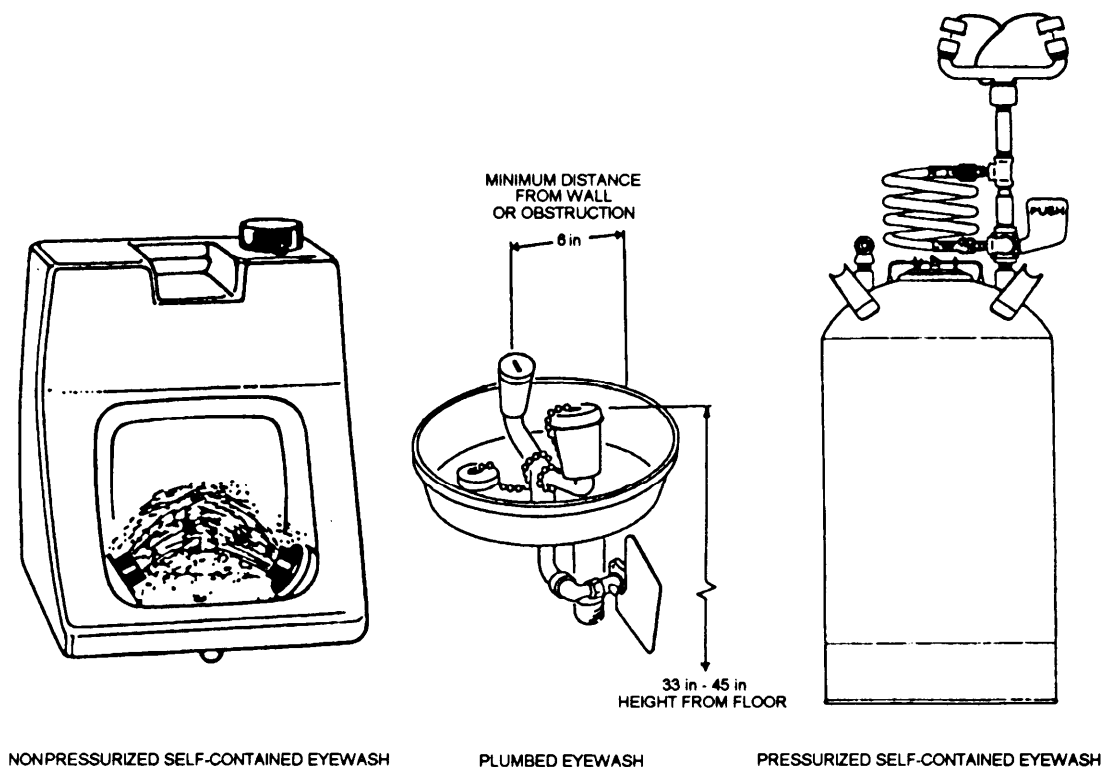


Figure 5-6.—Emergency eyewash stations.

### Emergency Eyewash Stations

Emergency eyewash facilities are designed to provide first aid to personnel who splash corrosive materials into their eyes. Corrosive materials are especially hazardous to the eyes because the longer the materials contact the eyes, the more damage they cause. If you get a chip of metal in your eye, as long as you don't rub your eye, the metal doesn't cause further damage. You have time to get to sick bay to have the eye treated. Chemicals continue to cause damage as long as they remain in the eyes. Taking the time to go to sick bay for treatment could result in serious damage to the eyes. For that reason we need on the spot first aid to wash the eye to dilute the chemical.

Areas in which corrosive materials are used must have emergency eyewash facilities. Make sure all such emergency facilities are easily accessible to personnel in need of them. Make sure the locations of all units are unobstructed and are located as close to the hazard as possible. In no instance should a person have to travel more than 100 feet or take more than 10 seconds to get to the eyewash unit. People who work in areas that use great quantities of corrosives face the risk of splashing the materials on their body. Those areas must be equipped with a combination deluge shower and eyewash station.

Plumbed and self-contained emergency eyewash equipment (fig. 5-6) flush the eyes using potable water. The minimum flow rate must be 0.4 gallons per minute for 15 continuous minutes. Ensure the velocity of the water will not hurt the user's eyes.

You must clearly mark each eyewash station with a safety instruction sign. Post signs in a visible location close to the eyewash unit. The sign must identify the unit as an emergency eyewash station.

### ASBESTOS CONTROL PROGRAM

For many years, the Navy used asbestos as the primary insulation (lagging) material in high-temperature machinery, shipboard boilers, and the piping of boiler plants at shore facilities. The material was used as floor tile, as gasket materials, and for other uses that required fire resistance. We now recognize airborne asbestos fibers as a major health hazard.

The Navy developed an asbestos exposure control program to protect and monitor personnel who have been exposed to asbestos. Aboard ship, many pipes and boilers still have asbestos insulation. However, the Navy started a program in the mid- 1970s to use less harmful materials, such as fibrous glass, for pipe and boiler insulation.

Asbestos removals are limited to intermediate maintenance activities, shipyards, or contractors. Aboard ship you cannot remove asbestos insulation except in an operational emergency approved by the commanding officer.

The Navy Asbestos Control Program, which is part of the NAVOSH Program, ensures compliance with OSHA regulations. It also prevents the exposure of any Navy personnel to asbestos. The program covers the following areas:

- Identifying asbestos hazards
- Controlling asbestos in the work environment
- Following strict work practices
- Properly disposing of asbestos waste
- Establishing an asbestos medical surveillance program
- Protecting the environment
- Training people to recognize asbestos hazards and observe necessary precautions

The program's purpose is to protect personnel who, through their job or in emergency situations, come into contact with asbestos. If personnel must handle asbestos, we must ensure they have the proper protection and training.

The Navy follows upon the health of personnel who may have been exposed to asbestos in their current work or in the past through the Asbestos Medical Surveillance Program. This program monitors the health of personnel exposed to asbestos before regulations were set. It also screens personnel currently assigned to emergency asbestos removal teams.

### **Asbestos Health Hazards**

The danger of asbestos results from the asbestos fibers that break off into small particles. These fibers are small enough that, when airborne, you can inhale them. Once deep in the lungs, the fibers cause scar tissue or tumors. We now link asbestos fiber exposure with diseases such as asbestosis, lung cancer, and mesothelioma. These asbestos diseases may not show up for 15 or more years after exposure. Most cases of lung cancer in workers exposed to asbestos occur among workers who smoke. Workers who smoke and are exposed to asbestos have chances 90 times greater of developing cancer.

### **Identifying Asbestos**

Can you identify asbestos? Can you tell by looking at lagging whether or not it is asbestos? The only way to determine if material contains asbestos is to analyze the materials under a microscope. Every tender and repair ship and most shore medical facilities have the microscopes needed to test materials for asbestos and to analyze suspected material. If in doubt about insulation, consider it to be dangerous.

Aboard ship, anyone seeing a potential asbestos hazard (open or torn lagging) should report the hazard to the chief engineer or safety officer immediately.

### **Controlling Exposure to Asbestos**

You should never try to handle, remove, or repair suspected asbestos material without proper authorization and special protective equipment. Each ship having asbestos on board must have a trained, 3-person asbestos rip-out team for emergencies. This team receives training, is medically monitored, and has special protective clothing and equipment available for use when needed.

For detailed information on asbestos protective measures, refer to *Naval Ships' Technical Manual (NSTM)*, chapter 635; *Thermal, Fire, and Acoustic Installation*, OPNAVINST 5100.19B, chapter B1; and OPNAVINST 5100.23C, chapter 17.

### **LEAD CONTROL PROGRAM**

We also recognize lead as a serious health hazard. If you ingest lead, it can damage your nervous system, blood-forming organs, kidneys, and reproductive system. Although we normally associate lead in the Navy with lead-based paints, we also come into contact with other sources of lead. To prevent lead poisoning and related injuries during the use, handling, removal, and melting of materials containing lead, the Navy developed the Lead Control Program. OPNAVINST 5100.23C, chapter 21, and OPNAVINST 5100.19B, chapter B10, explain the Lead Control Program.

The following items aboard ship contain lead:

- Batteries
- Pipe joints
- Lead-based paint
- Small arms ammunition
- Weights and cable sockets



- High-voltage cable shielding
- Ballast and radiation shielding

Lead exposure occurs during grinding, sanding, spraying, burning, melting, and soldering. Lead exposure can also occur during machining, disassembling engines with leaded gasoline, and handling contaminated protective clothing.

The greatest hazard comes from lead dust, since we can easily inhale or ingest the fine particles. Most ingestion exposures occur when personnel eat or smoke without washing the lead dust off their hands.

### **Elements of the Lead Control Program**

The Navy's Lead Control Program includes the following elements:

- Medical surveillance
- Worker and supervisor training
- Control of lead in the workplace
- Environmental protection and waste disposal procedures
- Periodic industrial hygiene surveys to identify potential hazards from lead sources

Whenever possible, the Navy substitutes lower lead content or lead-free paints and coating for paints containing lead. However, many lead-based paints are still in use in the Navy today. Existing coatings of paint may contain lead, especially if they are 5 years old or older.

### **Medical Surveillance for Lead Workers**

Medical surveillance for lead workers consists of a preplacement medical evaluation, blood-lead level monitoring, and follow-up evaluations. In addition, medical surveillance includes removing personnel from exposure to lead, when necessary, based on blood-lead levels. Personnel must take part in the program under the following conditions:

- When a work site is found to have an airborne level of 30 micrograms of lead per cubic meter of air for over 8 hours
- When the workers handle lead at least 30 days per year

We must teach and warn occasional lead workers and handlers (those who handle lead less than 30 days per year) about the hazards of lead.

## **RADIATION PROTECTION PROGRAM**

Radiation is energy transmitted through space in the form of electromagnetic waves (rays) or nuclear particles. Radiofrequency radiation, including microwaves; x-rays; and gamma, infrared, visible light, and ultraviolet rays are electromagnetic waves. Alpha particles, beta particles, and neutrons are nuclear particles.

### **CATEGORIES OF RADIATION**

Radiation is commonly divided into two categories, which are indicative of the energy of the wave or particle: ionizing and nonionizing radiation. Radiation with enough energy to strip electrons from atoms in the media through which it passes is known as ionizing radiation. Examples include alpha particles, beta particles, x-rays, and gamma rays. Less energetic radiation that is not capable of such electron stripping is known as nonionizing radiation. Radio waves, microwaves, visible light, and ultraviolet radiation belong to this category.

Potentially hazardous sources of ionizing and nonionizing radiation exist aboard Navy ships. Ionizing radiation sources include radioactive material and equipment that generate x-rays. Lasers, radar, and communications equipment emit nonionizing radiation.

### **RADIATION PROTECTION PROGRAM ELEMENTS**

The Radiation Protection Program consists of the following elements:

- Training
- Medical surveillance
- Identification and evaluation of radiation sources
- Investigation and reporting of radiation incidents
- Use of dosimetry to monitor exposure to ionizing radiation

OPNAVINST 5100.23C, chapter 22, and OPNAVINST 5100.19B, chapter B9, outline the Radiation Protection Program. This program is designed to minimize personnel exposure to radiation from sources other than nuclear weapons and nuclear power systems.

Nuclear weapons and nuclear power systems have their own radiation protection and control programs. The program excludes those individuals, who as patients, are exposed to radiation while undergoing diagnostic or therapeutic procedures.

## **RESPIRATORY PROTECTION PROGRAM**

Many repair and maintenance operations generate air contaminants that are dangerous if inhaled. Engineering controls, such as local exhaust ventilation, are the most effective methods of protecting personnel against such contaminants. When engineering controls are not possible, personnel must wear respiratory protection. OPNAVINST 5100.23C, chapter 15, and OPNAVINST 5100.19B, chapter B6, cover the Respiratory Protection Program.

The Respiratory Protection Program requires training, fit-testing, recordkeeping, medical screening, and procurement and tracking of equipment. It also requires the purchase of respirators, spare parts, and cartridges.

Respirators have been used by workers for centuries. Discomfort from dust and smells drove some workers to invent their own respirators using cloth and animal bladders. The coal mining industry took the lead in developing and certifying respirators for miners suffering from black lung disease. In the late 1960s and early 1970s, the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) were designated as the certifying agencies for respirators.

Respirators and respirator parts are designed and manufactured according to strict NIOSH and MSHA guidelines. Respirators that NIOSH and MSHA have tested and certified are labeled with a NIOSH/MSHA certification number. Parts are not interchangeable between manufacturers.

### **Elements of the Respiratory Protection Program**

The Respiratory Protection Program must include the following elements:

- Written standard operating procedures
- Proper, hazard-specific selection of respirators
- User training in the proper operation and limitations of respirators
- Regular cleaning and disinfection of respirators

- Convenient, clean, and sanitary storage of respirators
- Inspection, repair, and maintenance of respirators
- Industrial hygiene surveys to identify operations requiring respirators and to recommend specific types of respirators
- Periodic monitoring and evaluation of program effectiveness
- Medical qualification
- Use of only NIOSH and MSHA approved respirators
- Fit-testing

Ashore, the commanding officer or officer in charge starts the program by appointing, in writing, a certified respiratory protection program manager (RPPM). Afloat, the commanding officer appoints, in writing, a trained respiratory protection officer (RPO). Although the duties of the RPPM and the RPO are similar, the duties of each depend on the size of the command and the extent to which command personnel use respirators.

### **Selecting the Proper Respirators**

You must wear the correct respirator for the right job! A respirator is not going to do you any good if it is the wrong type. Some people believe they can wear the surgical masks worn by medical personnel during various evolutions, such as deck grinding and small welding jobs. Those blue surgical masks serve only one purpose—to keep the doctor from passing saliva to the patient. Surgical masks will not protect personnel from any type of air contaminant. Selecting and wearing the correct, properly fitted respirator is the only way workers can ensure they are protected.

### **Identifying Various Types of Air Contaminants**

When selecting a respirator, we must first understand the six types of air contamination we may be exposed to:

- Dust—Small solid particles created by the breaking up of larger particles by processes such as crushing, grinding, sanding, or chipping. Some dusts are very toxic, such as the sanding dust from lead-based paints.

- **Fumes**—Very small particles (1 micrometer or less) formed by the condensation of volatilized solids, usually metals. Fumes are produced from the welding, brazing, and cutting of metals.

- **Gas**—A material that under normal conditions of temperature and pressure tends to occupy the entire space uniformly. Such material includes hydrogen sulfide gas from the collection, holding, and transfer system; acid gas from battery charging; and ammonia gas from deck stripping. Gases are usually invisible and sometimes odorless.

- **Mist and Fog**—Finely divided liquid droplets suspended in air and generated by condensation or atomization. A fog is a mist of enough concentration to obscure vision. Mists are produced when you spray solutions such as paint and spray cleaners.

- **Smoke**—Carbon or soot particles less than 0.1 micrometer in size resulting from the incomplete combustion of carbonaceous materials such as coal or oil.

- **Vapor (inorganic or organic)**—The gaseous state of a substance that is normally a liquid or solid at room temperature. Vapors are produced by fuels, paints and thinners, solvent degreasers, hydraulic fluids, and dry-cleaning fluids.

Knowing what types of air contaminants these terms refer to is critical to the proper selection of respirators. For example, many people believe that paint gives off fumes. *Fumes* is a common term used to describe any smells in the air. However, fumes are actually a condensed particle of vaporized metal given off during welding or cutting. If you select a respirator labeled **Dust, Mist and Fumes** to protect you from paint vapors, you will not be protected. Respirator cartridges are labeled as to the type of protection they provide.

The workplace monitoring plan or the industrial hygiene survey will pinpoint those areas and processes that require respirators. Since most ships carry few exotic chemicals and have limited heavy industrial work, they don't need a great variety of respirators or cartridges. Ashore, extensive industrial work may require an activity to have a greater selection and variety of respirators.

### Identify Various Types of Respirators

You should be familiar with the three basic types of respirators: air-purifying, supplied-air, and self-contained. An **air-purifying** respirator removes air contaminants by filtering, absorbing, adsorbing, or

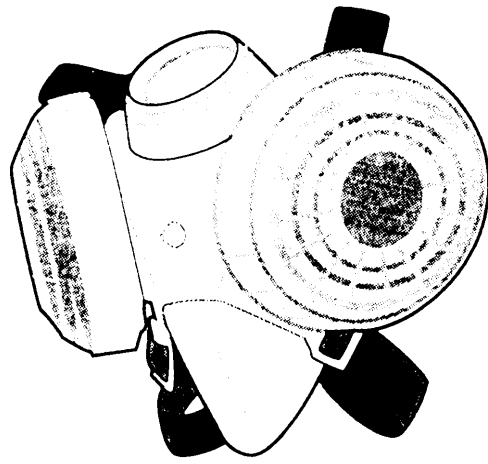


Figure 5-7.—Cartridge-type respirator.

chemical reaction. This respirator may be disposable or have a disposable prefilter on a cartridge (fig. 5-7).

You can only use the air-purifying respirator when the adequate oxygen (19.5 to 23.5 percent by volume) is available and the contaminant level is not immediately dangerous to life or health (IDLH). We classify air-purifying respirators as follows:

- **Particulate-removing**—These respirators have filters that remove dusts, mists, fumes, and smokes by physically trapping the material on the filter surface.
- **Gas- and vapor-removing**—These respirators have cartridges that absorb or chemically bind vapor or gas within the cartridge.
- **Combination particulate and gas- and vapor-removing**—These respirators are a combination of the preceding two types of respirators. They are required when you have a combination of materials such as a particle (mist) and a vapor.

Since these air-purifying respirators are negative-pressure respirators, they can only be used with air contaminants that have good warning properties, such as odor or taste. Warning properties indicate when the mask is leaking or the cartridge is used up.

The **supplied-air** respirator provides breathing air independent of the environment. You must wear this type of respirator when the following conditions exist:

1. Contaminant does not have enough odor, taste, or irritating warning properties

2. The contaminant is of such high concentration of toxicity that an air-purifying respirator is inadequate

We classify supplied-air respirators, also called air-line respirators, as demand, pressure-demand, and continuous-flow respirators. This respirator can be used in IDLH situation areas if operated in the pressure demand mode. It must also be equipped with an auxiliary, self-contained air supply of at least 15 minutes.

The breathing air source for air-line respirators must meet at least the minimum requirements for grade D breathing air. A ship's LP air is NOT suitable for use as breathing air unless it is specifically tested and certified to meet purity standards.

A self-contained breathing apparatus (SCBA) allows you complete independence from a fixed source of air. It allows the greatest degree of protection but is also the most complex. The SCBA provides protection in oxygen-deficient environments or other environments dangerous to life or health. The SCBA is equipped with a bottle of compressed air and is used in hazardous material spill kits.

### **Medical Screening and Fit-Testing Procedures Required Before Using a Respirator**

Before personnel can use a respirator, they must be medically screened and fit-tested. The ship's Hospital Corpsman, medical officer, or shore medical support clinic conducts the medical screening. Ashore, the clinic Occupational Health Division conducts medical screening for civilian workers. The purpose of the screening is to ensure that respirator users have no medical condition that inhibits their wearing a respirator. The screening also reviews the user's health record and potential for ill effects from working in a health-hazardous atmosphere.

A respirator mask must properly seal around the user's face to keep contaminated air from leaking into the mask. There are different brands, models, and sizes of respirators, all of which fit differently. Trained personnel from shore medical commands, environmental and preventive medicine units, or occupational safety and health offices fit-test respirator masks on potential users. First they have potential respirator users don a mask; then they test for leakage around the facepiece to ensure it seals properly. Afloat, larger ships and tenders, with primary duty safety officers, have trained fit-test personnel. Shore support

is provided to smaller ships. OPNAVINST 5100.23C, chapter 15, and OPNAVINST 5100.19B, chapter B6, give medical screening and fit-testing procedures.

## **PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT**

Personal protective equipment (PPE) protects the user in a hazardous environment. Any PPE breakdown, failure, or misuse immediately exposes the wearer to the hazard. Many protective devices, through misuse or improper maintenance, can become ineffective without the wearer knowing it. OPNAVINST 5100.23C, chapter 20, and OPNAVINST 5100.19B, chapter B12, provide information on PPE and PPE issue.

Personal protective devices do not reduce or eliminate the hazard itself. They merely set up a "last line of defense." Any equipment breakdown, failure, or misuse immediately exposes the worker to the hazard. PPE is used as an interim measure or when engineering controls cannot be applied.

### **Design and Construction of Personal Protective Clothing and Equipment**

All personal protective clothing and equipment should be designed and constructed to allow work to be performed safely. Therefore, extensive research and testing have been conducted to develop standards and specifications for the design and construction of personal protective clothing and equipment.

The federal government requires that personal protective clothing and equipment meet these standards and specifications. Therefore, the government only recognizes the certification and approval of certain agencies. Those agencies include the following:

- National Fire Protection Association (NFPA)
- American National Standards Institute (ANSI)
- Mine Safety and Health Administration (MSHA)
- Occupational Safety and Health Administration (OSHA)
- National Institute for Occupational Safety and Health (NIOSH)

All crewmembers must wear the required personal protective clothing and equipment. Workers should notify their supervisor immediately if the required clothing or equipment is not available to do the assigned work. Workers should also notify their supervisor if they need instruction on how to wear or use the clothing or



Figure 5-8.—Personal protective clothing and equipment.

equipment. All personnel required to wear personal protective clothing or equipment must receive training before first using it and annually thereafter.

### Types of Personal Protective Clothing and Equipment

We will now discuss the various types of personal protective clothing and equipment (fig. 5-8) designed to cover you from head to toe.

**HEAD PROTECTION.**— Helmets or hard hats protect crewmembers from the impact of falling and flying debris and from impact with low overheads. On a limited basis, they protect personnel from shock and

burn. Metal hard hats are not acceptable for shipboard use. Head protection is available in the supply system.

**FOOT PROTECTION.**— Navy life exposes personnel to a variety of foot hazards, from flight decks to machine shops to heavy supply parts stowage areas. For normal daily wear, personnel wear leather shoes. For protection against falling objects, personnel should wear safety shoes with built-in toe protection and nonslip soles. Other types of shoes available for specialty work are molder's boots and semiconductive shoes. Aboard ship, personnel cannot wear Corfam, plastic, or synthetic shoes in firerooms, main machinery spaces, or hot work areas. Safety shoes are provided to military personnel. Civilian employees are either provided safety

shoes from the supply system or a local purchasing agent or are reimbursed for their own purchase.

**HAND PROTECTION.**— Personnel should not wear gloves when operating rotating or moving machinery. However, they should wear gloves for protection against other types of hazards. Handling sharp materials requires the use of leather gloves. Performing hot work or handling hot items requires the use of heat-insulated, nonasbestos gloves. The use of portable electric tools in damp locations or during work on live electrical circuits or equipment requires the use of electrical-grade, insulating rubber gloves. Handling caustic or toxic chemicals requires specific gloves, depending on the type of substance being used. Thin rubber gloves or foodhandler-type gloves tear and leak easily and are not resistant to chemical absorption. Therefore, personnel must not use these gloves for any activity involving the use of a chemical substance. All types of gloves are available in the supply system.

**SAFETY CLOTHING.**— Safety clothing consists of flameproof coveralls, disposable coveralls, impervious chemical spill coveralls, welding leathers, and chemical aprons. When standing watch or working in a ship's fireroom, in main machinery spaces, and in hot work areas, personnel must wear fire-retardant coveralls. They should not wear synthetic clothing, such as certified Navy twill (CNT), in those areas. Aboard ship, fire retardant coveralls are provided as organizational clothing. Ashore, special protective clothing is provided at government expense.

**FALL PROTECTION EQUIPMENT.**— Personnel must wear parachute-type safety harnesses with Dyna-brake safety lanyards when climbing, working aloft, or working over the side. They should substitute wire rope for nylon working lanyards when performing hot work.

**FLOTATION DEVICES.**— Whenever personnel other than aircrew members and flight deck personnel are required to wear life jackets in open sea operations, the life jackets must be inherently buoyant. In exposed battle stations and when working over the side, personnel must wear jacket-type life preservers. They must also wear them topside in heavy weather, during replenishment at sea, and in small boats.

## **ELECTRICAL SAFETY PROGRAM**

Electrical shock is a serious hazard. If you combine high humidity, metal structures, high-voltage electricity, and perspiration, you have an electrical hazard. You must always observe safety precautions

when working around electric circuits and equipment to avoid injury from electric shock and short circuits. Records show most fatalities caused by electric shock result from people working on energized circuits and equipment. Post-mishap investigations show that they could have prevented these mishaps by following established safety precautions and procedures. A technician must view safety with a full appreciation of the various hazards involved in maintaining complex and sophisticated Navy equipment.

### **Elements of the Electrical Safety Program**

The Electrical Safety Program consists of the following elements:

- Following electrical safety standards
- Properly using equipment tag-out procedures
- Performing routine and periodic testing to detect and correct unsafe equipment
- Properly installing, maintaining, and repairing electrical and electronic equipment
- Performing control and safety testing of personal electrical and electronic equipment

### **Portable Electrical Tool Issue**

Ships must have a centralized portable electrical tool issue room for the daily issue of portable electrical tools. The electrical safety officer supervises operation of the portable electrical tool issue room. Personnel assigned to the portable electrical tool issue room perform daily inspections and safety testing of equipment before issuing it and upon its return.

Before issuing portable electrical tools, personnel assigned to the tool issue room brief tool users on routine tool safety precautions. In addition, they issue any required personal protective clothing and equipment. The tool custodian documents this briefing on the issue record. The custodian can issue tools only to personnel who have received ship's electrical safety training within the year.

Certain divisions or work centers maybe authorized permanent custody of selected electrical tools or equipment. These divisions perform required safety checks on their equipment. Personnel performing these checks must be members of an electrical or electronic rating. They must not issue these tools to other divisions.

Ashore, tools must meet Underwriters Laboratories (UL) approval or have a grounded metal case. Tools are

usually held by the user's shop or division and do not require electrical safety check for use ashore. *General Industry Standards*, 29 CFR 1910, and *Safety and Health Standards for Shipyard Employment*, 29 CFR 1915.132, address the shore Electrical Safety Program.

### **Basic Electrical Safety Training**

All personnel, when reporting aboard and annually thereafter, receive indoctrination on basic electrical safety. This indoctrination covers the requirements of using personal protective equipment, cardiopulmonary resuscitation (CPR), and first aid for electrical shock. Training for all personnel is documented and kept on file.

### **TAG-OUT/LOCK-OUT PROGRAM**

The Tag-Out/Lock-Out Program is a two-fold program. It ensures that personnel correctly tag out equipment before conducting maintenance and that personnel are notified when systems are not in a normal configuration. A Tag-Out/Lock-Out Program is necessary to prevent injury to personnel and damage to equipment.

Ships have a tag-out program, which requires the use of paper tags or labels to indicate systems are deenergized or under special configuration. Personnel must follow this program in the maintenance of all shipboard equipment, components, and systems. OPNAVINST 5100.19B, chapter B11, and OPNAVINST 3120.32C, section 630.17, cover this program.

Shore activities pattern their Tag-Out/Lock-Out Program after OSHA regulations. OPNAVINST 5100.23C, chapter 24, covers this program. The tags used ashore are very different from those used aboard ship, and in some instances locks are used to lock out a system.

Tag-out/lock-out procedures consist of a series of tags, adhesive labels, or locks. Personnel apply them to instruments, gauges, or meters to show that they are inoperative, restricted in use, or out of calibration. Each tag contains information personnel must know to avoid a mishap. All corrective maintenance should include standard tag-out/lock-out procedures, including work done by an intermediate maintenance or depot level activity. Coordination is required between shipyard and contract workers and afloat units when tagging-out shipboard systems.

Training ashore and afloat is needed to ensure personnel understand the Tag-Out/Lock-Out Program.

Detailed training is required for personnel authorized to administer the program.

### **GAS FREE ENGINEERING PROGRAM**

Why do we have gas free engineering? Entry into, work in, or work on confined or enclosed spaces may cause injury, illness, fires, or death. Hazards may result from flammable or explosive materials or atmospheres, toxic materials, or an oxygen-depleted atmosphere.

Personnel normally do not inhabit confined or enclosed spaces. We consider them unsafe for entry or work until an authorized person, usually the gas free engineer, tests the air. Then that person issues a gas free certificate stating the hazard or special precautions to follow. Only by carefully retesting the air in confined and enclosed spaces can we ensure the safety and health of personnel working in these areas.

### **Health and Fire Hazards**

A lack of oxygen in a confined space will not support life and may asphyxiate workers. The presence of toxic gases or vapors from paint or tank contamination may cause asphyxiation or intoxication. Flammable vapor or gas build-up could lead to a serious explosion or fire. Any combination of the above could lead to fatalities or serious injury or material damage if workers try to enter or work in the unknown atmosphere.

### **Gas Free Certificates**

The ship's gas free engineer (GFE) or the shore marine chemist is assigned to test the applicable space. Each person must obey the requirements and limitations outlined on a gas free certificate. The certificate is posted at the entrance to the space. It shows the conditions that existed at the time the tests were conducted. The following are examples of conditions documented on gas free certificates:

- SAFE FOR PERSONNEL—SAFE FOR HOT WORK
- SAFE FOR PERSONNEL—NOT SAFE FOR HOT WORK
- NOT SAFE FOR PERSONNEL—NOT SAFE FOR HOT WORK
- NOT SAFE FOR PERSONNEL WITHOUT PROTECTION—NOT SAFE FOR HOT WORK
- NOT SAFE FOR PERSONNEL INSIDE—SAFE FOR HOT WORK OUTSIDE

Aboard ship, a gas free certificate is good for a maximum of 8 hours. After 8 hours, the testing must be repeated. While testing, the GFE or the marine chemist must wear the protective equipment required by the certificate and his or her supervisor. Ashore, the gas free certificate issued by the marine chemist will indicate retest periodicity.

### Requesting Gas Free Services

Now that we know why we have gas free testing, we need to know who performs the service. Anytime you have a need to enter a confined or enclosed space aboard ship, you must make a request to have the space tested to ensure it is gas free. Contact the damage control assistant (DCA) or fire marshal to arrange for these services. For more information on the Gas Free Engineering Program afloat, consult OPNAVINST 5100.19B, chapter B8, and *Naval Ships' Technical Manual (NSTM)*, chapter 074, volume 3.

Ashore, the marine chemist performs gas free services as outlined in OPNAVINST 5100.23C, chapter 27.

### MEDICAL SURVEILLANCE PROGRAM

The Medical Surveillance Program monitors the continuing health of certain personnel. The results of the industrial hygiene surveys, as interpreted by qualified occupational health professionals, determine the selection of personnel for medical surveillance examinations. The medical department representative (MDR) and the division officer identify personnel who require medical surveillance. The MDR follows the guidance of the *Medical Surveillance Procedures Manual*; *Navy Occupational Health Information Management System (NOHIMS) Medical Matrix*; and *Navy Environmental Health Center (NAVENVHLTH-CEN) Technical Manual*, NEHC-TM91.5.

Navy facilities ashore and afloat establish military and civilian employee medical treatment and surveillance programs. Medical facilities ashore provide direct support to ships that are not equipped or staffed to provide appropriate medical surveillance and documentation. In general, these programs monitor the following areas:

- Job certification or recertification to determine a person's fitness to begin or continue to perform a job safely and effectively

- The effectiveness of major hazard-specific programs based on a continuing check on the health status of exposed personnel
- As a secondary prevention, the detection of early indicators of excessive exposure caused by the work environment before actual illness, disease, or injury occurs and to allow for the timely start of corrective actions to prevent any long-term adverse effects
- Compliance with the requirements of certain NAVOSH standards

### Medical Examinations

The types of examinations scheduled are preplacement or base-line, special-purpose or periodic, and termination. Medical examinations assess the health status of people as it relates to their work. These examinations produce specific information that determines the adequacy of protection for personnel from potential workplace hazards. The medical examination may include a physical examination, clinical laboratory tests, radiologic exams and physiologic testing, or an inquiry about the person's occupational history. OPNAV Form 5100/15, Medical Surveillance Questionnaire (figs. 5-9A and 5-9B), shows an individual's previous and current employment. This information helps identify work or other activities that may pose a potential health hazard for the person. Occupational medical examinations are scheduled based on a person's birth month or as operational requirements permit. For hazard-specific medical surveillance, a medical examination will be provided when the action level of the contaminant is exceeded. An examination is also provided when the exposure exceeds 30 days per year.

### Medical Records

Existing directives dictate procedures on the maintenance, retention, and disposal of medical records. The cognizant medical command, branch clinic, or Military Sealift Command medical offices maintain records consisting of forms, correspondence, and other files that relate to an employee's medical and occupational history. Other information includes occupational injuries or illnesses, physical examinations, and all other treatment received in a health unit. Included, too, are audiograms; pulmonary function tests; industrial hygiene computations; laboratory and x-ray findings; and records of personal exposure to physical, biological, and chemical hazards. A problem summary



MEDICAL SURVEILLANCE QUESTIONNAIRE								
<small>           PRIVACY ACT STATEMENT            *The authority to collect this information is Section 19 of the Occupational Safety and Health Act and the Code of Federal regulations (29 CFR 1950). This information will be used by the Occupational Health Physician, and/or such clinical staff as he may designate to help identify the causes of adverse health effects and for future epidemiology studies. Providing the information is voluntary; however, failure to provide the information could unnecessarily hamper the identification of potential health problems and preclude any redress of problems identified in the future.         </small>								
PART 1 - OCCUPATIONAL HISTORY								
<small>           Instructions: Please complete the following work history in chronological order from your first job to the present and list all part-time and full-time jobs you have held. Be as specific as possible. If you held more than one job with the same employer, list each title and activity. Use additional sheets, as needed.         </small>								
TODAY'S DATE	DATES		NO HRS WK	JOB TITLE AND WORK ACTIVITIES <small>(include employer if not Navy)</small>	POTENTIAL HAZARDS <small>(be as specific as possible)</small>	PROTECTIVE EQUIPMENT <small>(Respirator, ear plugs, protective clothing, etc)</small>		
	FROM MO/YR	TO MO/YR						
<small>           PATIENT'S IDENTIFICATION            (Use this space for mechanical            imprint)         </small>			PATIENT'S NAME (Last, first, Middle initial)				Sex	
			YEAR OF BIRTH	RELATIONSHIP TO SPONSOR	COMPONENT STATUS	DEPART SERVICE		
			SPONSOR'S NAME					
			SSN OR IDENTIFICATION NO				ORGANIZATION	

Figure 5-9A.—Medical Surveillance Questionnaire (front), OPNAV 5100/15.

list and copies of preemployment, disability retirement, and fitness for duty examinations are also included.

## GENERAL SAFETY PRECAUTIONS

Volume II (surface ship) and volume III (submarine) of OPNAVINST 5100.19B provide general safety precautions for forces afloat. OPNAVINST 5100.23C and *General Industry Standards*, 29 CFR 1910, provide shore safety precautions.

The afloat safety precautions specifically cover shipboard operations, such as heavy weather, underway

replenishment, cargo handling, and small boat operations. Consult these precautions to plan for training before specific evolutions. Afloat safety precautions only cover general precautions. Naval warfare publications (NWP) and technical manuals provide more detailed precautions.

In general, safety precautions ashore do not apply aboard ship. In other words, a civilian contractor bringing electrical equipment on board is not required to comply with the ship's electrical safety check program. The civilian employee follows OSHA safety precautions. OSHA is not authorized to inspect military

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**Figure 5-9B.—Medical Surveillance Questionnaire (back), OPNAV 5100/15.**

workers or ships for safety, but it is authorized to inspect civilian work sites aboard ship. OPNAVINST 5100.23C, chapter 11, and OPNAVINST 5100.19B, chapter A3, discuss these authorized OSHA inspections aboard ship.

## SUMMARY

The NAVOSH Program has been executed to protect civilian and military workers. We must do our

best to keep all of our trained personnel safe and healthy so that they are ready to perform their assigned tasks. As a responsible employer, the Navy is obligated to provide you with the safest and healthiest work environment possible. On older ships and shore facilities, especially, that can be a challenge. Every command must fully support the NAVOSH Program.

We discussed the various NAVOSH Program elements such as hearing conservation, sight conservation, respiratory protection, heat stress,

electrical safety, and personal protective clothing. In addition, we discussed hazardous material/hazardous waste, asbestos control, gas free engineering, lead control, and medical surveillance.

You have a duty to yourself and the people you work with to know and enforce all safety regulations. Before assigning personnel to a task that can harm them in any way, ensure they are familiar with and know the correct safety procedures. Make sure they are wearing the proper protective clothing and using the correct respirator. Provide them with adequate eye and hearing protection. Take no short cuts and do all jobs safely. Get

copies of OPNAVINST 5100.23C, *Naval Occupational Safety and Health (NAVOSH) Program Manual*, and OPNAVINST 5100.19B, *Navy Occupational Health and Safety Program Manual for Forces Afloat*. Become familiar with them. Remember the adage, “The life you save may be your own.”

Complacency, haste to complete a job, and the “it can’t happen to me” attitude can hinder an effective self-policing safety program. A safe environment requires us to stay alert, be patient, and think safety at all times.

